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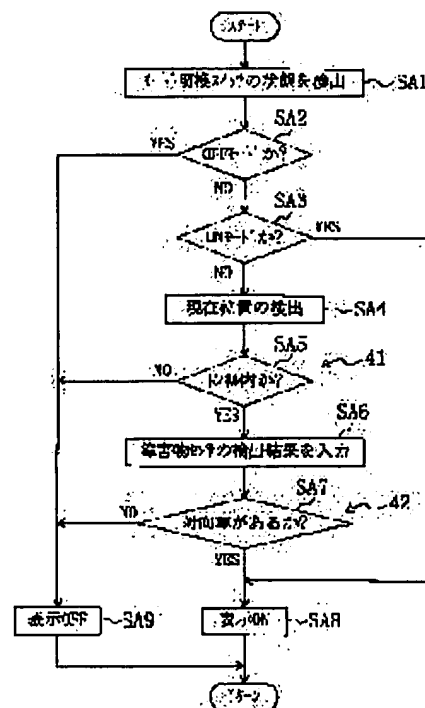
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(54) DISPLAY DEVICE FOR VEHICLE

(57)Abstract:

PROBLEM TO BE SOLVED: To more improve safety while preventing the display from obstructing the view of a driver as much as possible in the case of displaying an infrared ray image picked up by an infrared ray camera 12 on an infrared ray image display 3.

SOLUTION: When the intra-tunnel traveling of a vehicle C is detected by an intra-tunnel traveling detection means 41, the infrared ray image is displayed on the infrared ray image display 3. Also, it is judged that the vehicle C is traveling inside a specified traveling environment without the need of displaying the infrared ray image when the presence of an approaching vehicle is not detected by a specified traveling environment judgment means 42 and the infrared ray image is not displayed even when the intra-tunnel traveling is detected.



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CLAIMS

[Claim(s)]

[Claim 1] An image pick-up means to be formed in a car and to picturize the front of this car with infrared radiation, A transit detection means in a tunnel to be the display of the car equipped with a display means by which the infrared image which was prepared ahead [of the above-mentioned car / driver's seat], and was picturized by the above-mentioned image pick-up means is displayed, and to detect the transit in a tunnel of the above-mentioned car, The display of the car characterized by having a display-control means to display the above-mentioned infrared image on the above-mentioned display means when the transit in a tunnel of the above-mentioned car is detected by the above-mentioned transit detection means in a tunnel.

[Claim 2] A car is equipped with a specific transit environmental judging means to judge whether the inside of the specific transit environment where it is not necessary to display on a display means the infrared image picturized by the image pick-up means is under transit, in the display of a car according to claim 1. With the above-mentioned specific transit environmental judging means, when the above-mentioned car is judged as the inside of the above-mentioned specific transit environment being under transit, a display-control means The display of the car characterized by being constituted so that the above-mentioned infrared image may not be displayed on the above-mentioned display means even if the transit in a tunnel of a car is detected by the transit detection means in a tunnel.

[Claim 3] It is the indicating equipment of the car characterized by being the transit environment where the driver of a car does not produce dazzling in the light of an oncoming car in the indicating equipment of a car according to claim 2, as for a specific transit environment.

[Claim 4] A specific transit environment is the display of the car characterized by being the transit environment where an oncoming car does not exist in the display of a car according to claim 3.

[Claim 5] It is the display of the car characterized by being constituted so that it may judge with a car running in a specific transit environment when it has an oncoming car detection means by which a specific transit environmental judging means detects existence of an oncoming car in the display of a car according to claim 4 and existence of an oncoming car is not detected by this oncoming car detection means.

[Claim 6] In the display of a car according to claim 4 a specific transit environmental judging means It has a current position detection means to detect the current position of a car, and a traffic information storage means by which road map information was memorized. When it is detected that a car is running the road where the opposite lane does not exist based on the road map information memorized by the current position and the traffic information storage means of the car detected by this current position detection means The display of the car characterized by being constituted so that it may judge with a car running in a specific transit

environment.

[Claim 7] It is the display of the car characterized by having a distance-between-two-cars detection means by which a specific transit environmental judging means detects the distance between two cars of a car and a forward vehicle in the display of a car according to claim 3, and being constituted so that it may judge with a car running in a specific transit environment when the distance between two cars of the car and forward vehicle which were detected by this distance-between-two-cars detection means is below predetermined distance.

[Claim 8] It is the display of the car characterized by having a vehicle speed detection means by which a specific transit environmental judging means detects the vehicle speed of a car in the display of a car according to claim 3, and being constituted so that it may judge with a car running in a specific transit environment when the vehicle speed of the car detected by this vehicle speed detection means is below the predetermined vehicle speed.

[Claim 9] It is the display of the car carry out being constituted so that it may judge [that a car is under transit about the inside of a specific transit environment, and], when it has a delay transit detection means detect that a car is delay running in a specific transit environmental judging means in the display of a car according to claim 3 and delay transit of a car is detected by this delay transit detection means as the description.

[Claim 10] It is the display of the car characterized by to be constituted so that it may judge with a car not running [be / it] in a specific transit environment when it is detected that have a revolution detection means detect that the car is circling in the specific transit environmental judging means toward an opposite-lane side in the display of a car according to claim 3, and the car is circling toward an opposite-lane side with this revolution detection means.

[Claim 11] A revolution detection means is the display of the car characterized by being constituted so that it may detect that the car is circling toward an opposite lane side when the steering angle by the side of the opposite lane is more than a predetermined rudder angle in the display of a car according to claim 10.

[Claim 12] It is the display of the car characterized by to have the car and a distance detection means between the opposite lane that a specific transit environmental judging means detects the distance from a car to the opposite lane in the display of a car according to claim 3, and to be constituted so that it may judge with a car running in a specific transit environment when the distance from the car detected by this car and distance detection means between the opposite lane to the opposite lane is large than setting distance.

[Claim 13] It is the indicating equipment of the car carry out having a curve detection means detect that the curve in which a specific transit environmental judging means goes to an opposite-lane side ahead of a car in the indicating equipment of a car according to claim 3 exists, and being constituted so that it may judge [that a car is not / be / it / under transit about the inside of a specific transit environment, and] when it is detected that the curve which goes to an opposite-lane side ahead of a car with this curve detection means exists as the description.

[Claim 14] It is the indicating equipment of the car characterized by being the transit environment where it is hard to sense risk even if, as for a specific transit environment, the driver of a car receives the light of an oncoming car in the indicating equipment of a car according to claim 2.

[Claim 15] It is the display of the car characterized by having a width-of-road detection means to detect the width of road to which the car is running in the display of a car according to claim 14 in the specific transit environmental judging means, and being constituted so that it may judge with a car running in a specific transit environment when the width of road detected by this width-of-road detection means is larger than predetermined width of face.

[Claim 16] In the display of a car according to claim 14 a specific transit environmental judging means A current position detection means to detect the current position of a car, and a traffic information storage means by which road map information was memorized, It has a high use

frequency road extract means to extract the high use frequency road where the operating frequency of the driver of this car is high from the road map information memorized by this traffic information storage means. When it is detected that a car is running a high use frequency road based on the current position of the car detected by the above-mentioned current position detection means and the high use frequency road extracted by the high use frequency road extract means The display of the car characterized by being constituted so that it may judge with a car running in a specific transit environment.

[Claim 17] It is the display of the car characterized by to have an individual humanity news storage means by which a high use frequency road extract means memorizes individual humanity news in the display of a car according to claim 16, and to be constituted so that the high use frequency road of the driver which is performing current operation according to the individual humanity news memorized by this individual humanity news storage means may be extracted.

[Claim 18] A specific transit environmental judging means is the display of the car characterized by to be constituted so that it may judge with a car not running [be / it] in a specific transit environment even if a high use frequency road is under transit, when it is detected that the road where cautions of a driver are required for a car in the display of a car according to claim 16 based on a current position detection means and a traffic information storage means is under transit.

[Claim 19] In the display of a car according to claim 14 a specific transit environmental judging means It has an obstruction detection means to be the front of a car and to detect that an obstruction exists within criteria distance from this car. The display of the car characterized by being constituted so that it may judge with a car not running [be / it] in a specific transit environment, when it is detected that are the front of a car and an obstruction exists within criteria distance from this car with this obstruction detection means.

[Claim 20] A specific transit environmental judging means is the display of the car characterized by being constituted so that it may judge with a car running in a specific transit environment when the elapsed time after a car goes into a tunnel in the display of a car according to claim 2 is longer than predetermined time.

[Claim 21] It is the display of the car characterized by being constituted so that the illuminance ratio of tunnel inside and outside [means / specific transit environmental judging] is large in the display of a car according to claim 20 and predetermined time may be set as long time amount.

[Claim 22] It is the display of the car characterized by being the transit environment front scenery does not stop being able to be visible easily immediately after, as for a specific transit environment, a car goes into a tunnel in the display of a car according to claim 2.

[Claim 23] It is the display of the car characterized by being constituted so that it may judge with a car running in a specific transit environment in the display of a car according to claim 22 when a specific transit environmental judging means has the illuminance ratio of tunnel inside and outside smaller than the set point.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention belongs to the technical field about the display of the car. It was made to display on the display means which picturized the front of a car with infrared radiation and prepared this picturized infrared image ahead [driver's seat].

[0002]

[Description of the Prior Art] In order to offer operation exchange for a driver conventionally while visibility, such as Nighttime and a thick fog, is running in a bad transit environment as shown in JP,10-230805,A, JP,6-247184,A, JP,60-231193,A, etc., the front of a car is picturized with infrared radiation and making it make it display on the display which prepared this picturized infrared image ahead [driver's seat] is known.

[0003]

[Problem(s) to be Solved by the Invention] By the way, since the thing of a driver for which it may become offensive to the eye and has a bad influence on operation on the contrary can be considered if the infrared image is always displayed on a display when displaying an infrared image on a display as mentioned above, especially visibility gets worse and it is desirable for a driver to display an infrared image, while the car is running risk in a sensitive transit environment.

[0004] This invention is made in view of this point, and the place made into the purpose is in what it is going to raise safety for, making it the display not become offensive to the eye [a driver] as much as possible, when displaying an infrared image on a display.

[0005]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, it was made to display an infrared image on a display means in this invention, when the transit in a tunnel of a car is detected.

[0006] By invention of claim 1, it is prepared in a car and aimed concrete at the display of the car equipped with an image pick-up means to picturize the front of this car with infrared radiation, and a display means by which the infrared image which was prepared ahead [of the above-mentioned car / driver's seat], and was picturized by the above-mentioned image pick-up means is displayed.

[0007] And it shall have a transit detection means in a tunnel to detect the transit in a tunnel of the above-mentioned car, and a display-control means to display the above-mentioned infrared image on the above-mentioned display means when the transit in a tunnel of the above-mentioned car is detected by the above-mentioned transit detection means in a tunnel.

[0008] Since visibility gets worse suddenly and an infrared image is displayed especially for a driver in risk by the above-mentioned configuration at the time of the sensitive transit in a tunnel, the visibility in a tunnel can improve and the safety at the time of the transit in a tunnel can be raised. On the other hand, at the times other than the transit in a tunnel, since an

infrared image is not displayed (until a driver carries out ON actuation of the display on-switch of an infrared image), it is not usually almost that the display becomes offensive to the eye [a driver].

[0009] In invention of claim 2, a car is equipped with a specific transit environmental judging means to judge whether the inside of the specific transit environment where it is not necessary to display on a display means the infrared image picturized by the image pick-up means is under transit, in invention of claim 1. With the above-mentioned specific transit environmental judging means, when the above-mentioned car is judged as the inside of the above-mentioned specific transit environment being under transit, a display-control means Even if the transit in a tunnel of a car is detected by the transit detection means in a tunnel, it shall be constituted so that the above-mentioned infrared image may not be displayed on the above-mentioned display means.

[0010] If the inside of the specific transit environment where safety can be secured is under transit by this even if it is transit in a tunnel, since an infrared image will not be displayed, as the display of an infrared image does not become offensive to the eye [a driver] as much as possible, safety can be raised further.

[0011] In invention of claim 3, a specific transit environment shall be a transit environment where the driver of a car does not produce dazzling in the light of an oncoming car, in invention of claim 2. Moreover, in invention of claim 4, a specific transit environment shall be a transit environment where an oncoming car does not exist, in invention of claim 3. That is, since there is almost no possibility of a driver producing dazzling in the light of an oncoming car, and cherishing anxiety in transit while running in such a transit environment, it is satisfactory even if it does not display an infrared image.

[0012] In invention of claim 4, when it has an oncoming car detection means to detect existence of an oncoming car and existence of an oncoming car is not detected by this oncoming car detection means, the specific transit environmental judging means shall consist of invention of claim 5 so that it may judge with a car running in a specific transit environment.

[0013] When a laser radar etc. actually detects existence of an oncoming car and existence of an oncoming car is detected by this, while it is judged with the inside of a specific transit environment not being [be / it] under transit and the display of an infrared image is made, when existence of an oncoming car is not detected, it is judged with the inside of a specific transit environment being under transit, and an infrared image is not displayed.

[0014] In invention of claim 6, it sets to invention of claim 4. A specific transit environmental judging means It has a current position detection means to detect the current position of a car, and a traffic information storage means by which road map information was memorized. When it is detected that a car is running the road where the opposite lane does not exist based on the road map information memorized by the current position and the traffic information storage means of the car detected by this current position detection means It shall be constituted so that it may judge with a car running in a specific transit environment.

[0015] When it is detected that the one-way road where the opposite lane does not exist by carrying out like this with the current position detection means and the road map information storage means which a GPS signal etc. detects the current position is under transit, it is judged with the inside of a specific transit environment being under transit, and an infrared image is not displayed.

[0016] In invention of claim 3, the specific transit environmental judging means has a distance-between-two-cars detection means to detect the distance between two cars of a car and a forward vehicle, and when the distance between two cars of the car and forward vehicle which were detected by this distance-between-two-cars detection means is below predetermined distance, it shall consist of invention of claim 7 so that it may judge with a car running in a specific transit environment. Moreover, in invention of claim 3, the specific transit

environmental judging means has a vehicle speed detection means to detect the vehicle speed of a car, and when the vehicle speed of the car detected by this vehicle speed detection means is below the predetermined vehicle speed, it shall consist of invention of claim 8 so that it may judge with a car running in a specific transit environment. Furthermore, in invention of claim 3, when it has a delay transit detection means detect that a car is delay running in a specific transit environmental judging means and delay transit of a car is detected by this delay transit detection means, it shall consist of invention of claim 9 so that it may judge [that a car is under transit about the inside of a specific transit environment, and]. That is, since the driver of a car does not produce dazzling in the light of an oncoming car at the times under delay transit (the vehicle speed with the short distance between two cars is slow) etc., even if a car does not display an infrared image, it is satisfactory.

[0017] When it is detected that have a revolution detection means detect that the car is circling toward an opposite-lane side, and the car is circling toward an opposite-lane side with this revolution detection means, in invention of claim 3, the specific transit environmental judging means shall consist of invention of claim 10 so that it may judge that a car is not running [be / it] in a specific transit environment.

[0018] Since a driver tends to produce dazzling in the light of an oncoming car while the car is circling toward an opposite lane side by this, it is judged with the inside of a specific transit environment not being [be / it] under transit, and the display of an infrared image is made.

[0019] In invention of claim 10, when the steering angle by the side of the opposite lane is more than a predetermined rudder angle, the revolution detection means shall consist of invention of claim 11 so that it may detect that the car is circling toward an opposite lane side. By carrying out like this, the revolution (curve transit and lane modification) by the side of the opposite lane is certainly [easily and] detectable.

[0020] A specific transit environmental judging means has the car and a distance detection means between the opposite lane of detecting the distance from a car to the opposite lane, and when the distance from the car detected by this car and distance detection means between the opposite lane to the opposite lane is large than setting distance, it shall consist of invention of claim 12 in invention of claim 3 so that it may judge with a car running in a specific transit environment.

[0021] Like [in the case of running the foot-walk side among the case where a median strip exists, or two or more lanes, by this], when the distance from a car to the opposite lane is larger than setting distance, it is judged with the inside of the specific transit environment where a driver does not produce dazzling in the light of an oncoming car being under transit, and an infrared image is not displayed.

[0022] It has a curve detection means detect that the curve in which a specific transit environmental judging means goes to an opposite-lane side ahead of a car in invention of claim 3 at invention of claim 13 exists, and when it is detected that the curve which goes to an opposite-lane side ahead of a car with this curve detection means exists, it shall be constituted so that it may judge [that a car is not / be / it / under transit about the inside of a specific transit environment, and].

[0023] Since it is expected that a driver produces dazzling in the light of an oncoming car when it is detected that the curve which goes to an opposite lane side by communication link between highway and vehicle etc. exists by this, it is judged with the inside of a specific transit environment not being [be / it] under transit, and the display of an infrared image is made.

[0024] In invention of claim 14, in invention of claim 2, a specific transit environment shall be a transit environment where it is hard to sense risk, even if the driver of a car receives the light of an oncoming car. That is, while running in such a transit environment, it is satisfactory even if it does not display an infrared image by that which does not almost have possibility of a driver producing dazzling in the light of an oncoming car, and cherishing anxiety in transit (a driver

cannot sense risk easily).

[0025] In invention of claim 14, the specific transit environmental judging means has a width-of-road detection means to detect the width of road the car is running, and when the width of road detected by this width-of-road detection means is larger than predetermined width of face, it shall consist of invention of claim 15 so that it may judge with a car running in a specific transit environment.

[0026] It is judged with the inside of the specific transit environment where it is hard to sense risk even if a driver receives the light of an oncoming car being under transit by this invention, when the width of road is larger than predetermined width of face, and an infrared image is not displayed.

[0027] In invention of claim 16, it sets to invention of claim 14. A specific transit environmental judging means A current position detection means to detect the current position of a car, and a traffic information storage means by which road map information was memorized, It has a high use frequency road extract means to extract the high use frequency road where the operating frequency of the driver of this car is high from the road map information memorized by this traffic information storage means. When it is detected that a car is running a high use frequency road based on the current position of the car detected by the above-mentioned current position detection means and the high use frequency road extracted by the high use frequency road extract means It shall be constituted so that it may judge with a car running in a specific transit environment.

[0028] Since it is hard to sense risk even if the driver of a car receives the light of an oncoming car while a driver is running the high use frequency road which grasps the road situation etc. well by this, the display of an infrared image is not performed.

[0029] In invention of claim 16, the high use frequency road extract means shall have an individual humanity news storage means to memorize individual humanity news, and it shall consist of invention of claim 17 so that the high use frequency road of the driver which is performing current operation may be extracted according to the individual humanity news memorized by this individual humanity news storage means.

[0030] The high use frequency road of a driver where individual humanity news, such as an identifier of a driver and the house address, is performing current operation like the smart card by this according to the contents of storage of the individual humanity news storage means inputted and memorized is extracted. Therefore, a high use frequency road can be easily extracted for every driver.

[0031] In invention of claim 16, when it is detected that a car is running a road to be warned [of a driver] based on a current position detection means and a traffic information storage means, the specific transit environmental judging means shall consist of invention of claim 18 so that it may judge with a car not running [be / it] in a specific transit environment, even if a high use frequency road is under transit.

[0032] By carrying out like this, since an infrared image is displayed even if it is a high use frequency road while the width of road is running a road to be warned [of a driver] like a narrow road, safety can be raised further.

[0033] In invention of claim 19, it sets to invention of claim 14. A specific transit environmental judging means It has an obstruction detection means to be the front of a car and to detect that an obstruction exists within criteria distance from this car. When it is detected that are the front of a car and an obstruction exists within criteria distance from this car with this obstruction detection means, it shall be constituted so that it may judge with a car not running [be / it] in a specific transit environment.

[0034] It is judged with the inside of a specific transit environment not being [be / it] under transit by this, when it is the front of a car and an obstruction exists within criteria distance from this car, an infrared image is displayed, and safety can be raised.

[0035] In invention of claim 2, when the elapsed time after a car goes into a tunnel is longer than predetermined time, the specific transit environmental judging means shall consist of invention of claim 20 so that it may judge with a car running in a specific transit environment.

[0036] If predetermined time passes while it is judged with the inside of a specific transit environment not being [be / it] under transit by this invention after going into a tunnel until predetermined time (time amount concerning the dark adaptation of people's eye) passes and an infrared image is displayed, it will be judged with the inside of a specific transit environment being under transit, and the display of an infrared image will no longer be made.

[0037] In invention of claim 20, the specific transit environmental judging means shall consist of invention of claim 21 so that the illuminance ratio of tunnel inside and outside is large, and predetermined time may be set as long time amount. By carrying out like this, since the time amount concerning dark adaptation becomes long so that the illuminance ratio of tunnel inside and outside is large, predetermined time can be set up appropriately.

[0038] In invention of claim 22, a specific transit environment shall be a transit environment front scenery does not stop being able to be visible easily immediately after a car goes into a tunnel in invention of claim 2. That is, even if it goes into a tunnel like at nighttime, when front scenery does not stop being able to be visible easily, it is satisfactory even if it does not display an infrared image.

[0039] In invention of claim 22, when the illuminance ratio of tunnel inside and outside is smaller than the set point, the specific transit environmental judging means shall consist of invention of claim 23 so that it may judge with a car running in a specific transit environment. Since front scenery does not stop being able to be visible easily immediately after going into a tunnel like [at the time of Nighttime] due to this when the illuminance ratio of tunnel inside and outside is small, an infrared image is not displayed.

[0040]

[Embodiment of the Invention] (Operation gestalt 1) Drawing 1 shows the important section of the instrument panel 1 of Car C (automobile: refer to drawing 3 and drawing 4) in which the display concerning the operation gestalt 1 of this invention was carried, and the entertainment display 2 and the infrared image display 3 as a display means by which the below-mentioned infrared image is displayed are formed in this instrument panel 1. The above-mentioned entertainment display 2 is the center of the vertical direction abbreviation of an instrument panel 1, and is arranged by the cross direction abbreviation mid gear. On the other hand, the above-mentioned infrared image display 3 is arranged in the drivers side edge in the meter unit 4 which is the upper part of an instrument panel 1 and was prepared in the cross direction abbreviation mid gear. By this, the infrared image display 3 will be arranged in the drivers side slanting upper part to the entertainment display 2.

[0041] Various warning lights, such as an AC-dynamo warning light and an oil pressure warning light, are prepared in a speedometer, a fuel gage, a water temperature gage, an odometer, a trip recorder, a selector indicator light and indicator lights, such as a turn signal indicator light, and a list at the above-mentioned meter unit 4.

[0042] As the above-mentioned meter unit 4 (infrared image display 3) is shown in drawing 2 , while being arranged in the before [a car] side edge section of an instrument panel 1, the above-mentioned entertainment display 2 is arranged in the backside [a car] rather than the infrared image display 3. By this, the perpendicular check-by-looking angle of the entertainment display 2, i.e., the vertical vectorial angle of the line which connects the entertainment display 2 and the eye point of the driver of Car C, is set as about 22 degrees, and the perpendicular check-by-looking angle of the infrared image display 3 is set as about 11 degrees, and the visibility of the infrared image display 3 is good rather than the entertainment display 2.

[0043] In addition, five are mounted electronic equipment (illustration is omitted in drawing 2),

such as audio equipment, among drawing 1 , 6 is a steering wheel, and seven are front window glass among drawing 2 .

[0044] As shown in drawing 3 , the obstruction sensor 11 which detects the obstruction which exists ahead of this car C (the slanting front is also included), and measures the physical relationship and distance of Car C and its obstruction is formed in the front grille section of the cross direction abbreviation center section in the front end section of this car C. Specifically as this obstruction sensor 11, they are a laser radar, a millimeter wave radar, an ultrasonic radar, a CCD camera, etc.

[0045] Moreover, the infrared camera 12 as an image pick-up means to picturize the front of Car C with infrared radiation is formed in the side of the above-mentioned obstruction sensor 11 in a before [Car C] side bumper, and the infrared image picturized by this infrared camera 12 is displayed on the above-mentioned infrared image display 3. And a display on the infrared image display 3 of the above-mentioned infrared image is controlled by CPU20 as a display-control means like the after-mentioned, and an infrared image is displayed on the infrared image display 3, or it is not displayed.

[0046] Moreover, the rudder angle sensor 25 which detects the steering angle of the above-mentioned steering wheel 6 as shown in this car C at drawing 4 , The speed sensor 26 which detects the vehicle speed, and the GPS signal transmitted from a GPS satellite are received.

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TECHNICAL FIELD

[Field of the Invention] This invention belongs to the technical field about the display of the car it was made to display on the display means which picturized the front of a car with infrared radiation and prepared this picturized infrared image ahead [driver's seat].

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PRIOR ART

[Description of the Prior Art] In order to offer operation exchange for a driver conventionally while visibility, such as Nighttime and a thick fog, is running in a bad transit environment as shown in JP,10-230805,A, JP,6-247184,A, JP,60-231193,A, etc., the front of a car is picturized with infrared radiation and making it make it display on the display which prepared this picturized infrared image ahead [driver's seat] is known.

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EFFECT OF THE INVENTION

[Effect of the Invention] Safety can be raised making it the display of an infrared image not become offensive to the eye [a driver] as much as possible by having made it display an infrared image on a display means according to the display of the car of this invention, as explained above, when the transit in a tunnel of a car is detected. When a car is especially judged as the inside of the specific transit environment on which it is not necessary to display an infrared image being under transit, the above-mentioned effectiveness can be demonstrated much more effectively by making it not display an infrared image, even if the transit in a tunnel is detected.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] By the way, since the thing of a driver for which it may become offensive to the eye and has a bad influence on operation on the contrary can be considered if the infrared image is always displayed on a display when displaying an infrared image on a display as mentioned above, especially visibility gets worse and it is desirable for a driver to display an infrared image, while the car is running risk in a sensitive transit environment.

[0004] This invention is made in view of this point, and the place made into the purpose is in what it is going to raise safety for, making it the display not become offensive to the eye [a driver] as much as possible, when displaying an infrared image on a display.

[Translation done.]

*** NOTICES ***

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, it was made to display an infrared image on a display means in this invention, when the transit in a tunnel of a car is detected.

[0006] By invention of claim 1, it is prepared in a car and aimed concrete at the display of the car equipped with an image pick-up means to picturize the front of this car with infrared radiation, and a display means by which the infrared image which was prepared ahead [of the above-mentioned car / driver's seat], and was picturized by the above-mentioned image pick-up means is displayed.

[0007] And it shall have a transit detection means in a tunnel to detect the transit in a tunnel of the above-mentioned car, and a display-control means to display the above-mentioned infrared image on the above-mentioned display means when the transit in a tunnel of the above-mentioned car is detected by the above-mentioned transit detection means in a tunnel.

[0008] Since visibility gets worse suddenly and an infrared image is displayed especially for a driver in risk by the above-mentioned configuration at the time of the sensitive transit in a tunnel, the visibility in a tunnel can improve and the safety at the time of the transit in a tunnel can be raised. On the other hand, at the times other than the transit in a tunnel, since an infrared image is not displayed (until a driver carries out ON actuation of the display on-switch of an infrared image), it is not usually almost that the display becomes offensive to the eye [a driver].

[0009] In invention of claim 2, a car is equipped with a specific transit environmental judging means to judge whether the inside of the specific transit environment where it is not necessary to display on a display means the infrared image picturized by the image pick-up means is under transit, in invention of claim 1. With the above-mentioned specific transit environmental judging means, when the above-mentioned car is judged as the inside of the above-mentioned specific transit environment being under transit, a display-control means Even if the transit in a tunnel of a car is detected by the transit detection means in a tunnel, it shall be constituted so that the above-mentioned infrared image may not be displayed on the above-mentioned display means.

[0010] If the inside of the specific transit environment where safety can be secured is under transit by this even if it is transit in a tunnel, since an infrared image will not be displayed, as the display of an infrared image does not become offensive to the eye [a driver] as much as possible, safety can be raised further.

[0011] In invention of claim 3, a specific transit environment shall be a transit environment where the driver of a car does not produce dazzling in the light of an oncoming car, in invention of claim 2. Moreover, in invention of claim 4, a specific transit environment shall be a transit environment where an oncoming car does not exist, in invention of claim 3. That is, since there is almost no possibility of a driver producing dazzling in the light of an oncoming car, and cherishing anxiety in transit while running in such a transit environment, it is satisfactory even if

it does not display an infrared image.

[0012] In invention of claim 4, when it has an oncoming car detection means to detect existence of an oncoming car and existence of an oncoming car is not detected by this oncoming car detection means, the specific transit environmental judging means shall consist of invention of claim 5 so that it may judge with a car running in a specific transit environment.

[0013] When a laser radar etc. actually detects existence of an oncoming car and existence of an oncoming car is detected by this, while it is judged with the inside of a specific transit environment not being [be / it] under transit and the display of an infrared image is made, when existence of an oncoming car is not detected, it is judged with the inside of a specific transit environment being under transit, and an infrared image is not displayed.

[0014] In invention of claim 6, it sets to invention of claim 4. A specific transit environmental judging means It has a current position detection means to detect the current position of a car, and a traffic information storage means by which road map information was memorized. When it is detected that a car is running the road where the opposite lane does not exist based on the road map information memorized by the current position and the traffic information storage means of the car detected by this current position detection means It shall be constituted so that it may judge with a car running in a specific transit environment.

[0015] When it is detected that the one-way road where the opposite lane does not exist by carrying out like this with the current position detection means and the road map information storage means which a GPS signal etc. detects the current position is under transit, it is judged with the inside of a specific transit environment being under transit, and an infrared image is not displayed.

[0016] In invention of claim 3, the specific transit environmental judging means has a distance-between-two-cars detection means to detect the distance between two cars of a car and a forward vehicle, and when the distance between two cars of the car and forward vehicle which were detected by this distance-between-two-cars detection means is below predetermined distance, it shall consist of invention of claim 7 so that it may judge with a car running in a specific transit environment. Moreover, in invention of claim 3, the specific transit environmental judging means has a vehicle speed detection means to detect the vehicle speed of a car, and when the vehicle speed of the car detected by this vehicle speed detection means is below the predetermined vehicle speed, it shall consist of invention of claim 8 so that it may judge with a car running in a specific transit environment. Furthermore, in invention of claim 3, when it has a delay transit detection means detect that a car is delay running in a specific transit environmental judging means and delay transit of a car is detected by this delay transit detection means, it shall consist of invention of claim 9 so that it may judge [that a car is under transit about the inside of a specific transit environment, and]. That is, since the driver of a car does not produce dazzling in the light of an oncoming car at the times under delay transit (the vehicle speed with the short distance between two cars is slow) etc., even if a car does not display an infrared image, it is satisfactory.

[0017] When it is detected that have a revolution detection means detect that the car is circling toward an opposite-lane side, and the car is circling toward an opposite-lane side with this revolution detection means, in invention of claim 3, the specific transit environmental judging means shall consist of invention of claim 10 so that it may judge that a car is not running [be / it] in a specific transit environment.

[0018] Since a driver tends to produce dazzling in the light of an oncoming car while the car is circling toward an opposite lane side by this, it is judged with the inside of a specific transit environment not being [be / it] under transit, and the display of an infrared image is made.

[0019] In invention of claim 10, when the steering angle by the side of the opposite lane is more than a predetermined rudder angle, the revolution detection means shall consist of invention of claim 11 so that it may detect that the car is circling toward an opposite lane side.

By carrying out like this, the revolution (curve transit and lane modification) by the side of the opposite lane is certainly [easily and] detectable.

[0020] A specific transit environmental judging means has the car and a distance detection means between the opposite lane of detecting the distance from a car to the opposite lane, and when the distance from the car detected by this car and distance detection means between the opposite lane to the opposite lane is large than setting distance, it shall consist of invention of claim 12 in invention of claim 3 so that it may judge with a car running in a specific transit environment.

[0021] Like [in the case of running the foot-walk side among the case where a median strip exists, or two or more lanes, by this], when the distance from a car to the opposite lane is larger than setting distance, it is judged with the inside of the specific transit environment where a driver does not produce dazzling in the light of an oncoming car being under transit, and an infrared image is not displayed.

[0022] It has a curve detection means detect that the curve in which a specific transit environmental judging means goes to an opposite-lane side ahead of a car in invention of claim 3 at invention of claim 13 exists, and when it is detected that the curve which goes to an opposite-lane side ahead of a car with this curve detection means exists, it shall be constituted so that it may judge [that a car is not / be / it / under transit about the inside of a specific transit environment, and].

[0023] Since it is expected that a driver produces dazzling in the light of an oncoming car when it is detected that the curve which goes to an opposite lane side by communication link between highway and vehicle etc. exists by this, it is judged with the inside of a specific transit environment not being [be / it] under transit, and the display of an infrared image is made.

[0024] In invention of claim 14, in invention of claim 2, a specific transit environment shall be a transit environment where it is hard to sense risk, even if the driver of a car receives the light of an oncoming car. That is, while running in such a transit environment, it is satisfactory even if it does not display an infrared image by that which does not almost have possibility of a driver producing dazzling in the light of an oncoming car, and cherishing anxiety in transit (a driver cannot sense risk easily).

[0025] In invention of claim 14, the specific transit environmental judging means has a width-of-road detection means to detect the width of road the car is running, and when the width of road detected by this width-of-road detection means is larger than predetermined width of face, it shall consist of invention of claim 15 so that it may judge with a car running in a specific transit environment.

[0026] It is judged with the inside of the specific transit environment where it is hard to sense risk even if a driver receives the light of an oncoming car being under transit by this invention, when the width of road is larger than predetermined width of face, and an infrared image is not displayed.

[0027] In invention of claim 16, it sets to invention of claim 14. A specific transit environmental judging means A current position detection means to detect the current position of a car, and a traffic information storage means by which road map information was memorized, It has a high use frequency road extract means to extract the high use frequency road where the operating frequency of the driver of this car is high from the road map information memorized by this traffic information storage means. When it is detected that a car is running a high use frequency road based on the current position of the car detected by the above-mentioned current position detection means and the high use frequency road extracted by the high use frequency road extract means It shall be constituted so that it may judge with a car running in a specific transit environment.

[0028] Since it is hard to sense risk even if the driver of a car receives the light of an oncoming car while a driver is running the high use frequency road which grasps the road situation etc.

well by this, the display of an infrared image is not performed.

[0029] In invention of claim 16, the high use frequency road extract means shall have an individual humanity news storage means to memorize individual humanity news, and it shall consist of invention of claim 17 so that the high use frequency road of the driver which is performing current operation may be extracted according to the individual humanity news memorized by this individual humanity news storage means.

[0030] The high use frequency road of a driver where individual humanity news, such as an identifier of a driver and the house address, is performing current operation like the smart card by this according to the contents of storage of the individual humanity news storage means inputted and memorized is extracted. Therefore, a high use frequency road can be easily extracted for every driver.

[0031] In invention of claim 16, when it is detected that a car is running a road to be warned [of a driver] based on a current position detection means and a traffic information storage means, the specific transit environmental judging means shall consist of invention of claim 18 so that it may judge with a car not running [be / it] in a specific transit environment, even if a high use frequency road is under transit.

[0032] By carrying out like this, since an infrared image is displayed even if it is a high use frequency road while the width of road is running a road to be warned [of a driver] like a narrow road, safety can be raised further.

[0033] In invention of claim 19, it sets to invention of claim 14. A specific transit environmental judging means It has an obstruction detection means to be the front of a car and to detect that an obstruction exists within criteria distance from this car. When it is detected that are the front of a car and an obstruction exists within criteria distance from this car with this obstruction detection means, it shall be constituted so that it may judge with a car not running [be / it] in a specific transit environment.

[0034] It is judged with the inside of a specific transit environment not being [be / it] under transit by this, when it is the front of a car and an obstruction exists within criteria distance from this car, an infrared image is displayed, and safety can be raised.

[0035] In invention of claim 2, when the elapsed time after a car goes into a tunnel is longer than predetermined time, the specific transit environmental judging means shall consist of invention of claim 20 so that it may judge with a car running in a specific transit environment.

[0036] If predetermined time passes while it is judged with the inside of a specific transit environment not being [be / it] under transit by this invention after going into a tunnel until predetermined time (time amount concerning the dark adaptation of people's eye) passes and an infrared image is displayed, it will be judged with the inside of a specific transit environment being under transit, and the display of an infrared image will no longer be made.

[0037] In invention of claim 20, the specific transit environmental judging means shall consist of invention of claim 21 so that the illuminance ratio of tunnel inside and outside is large, and predetermined time may be set as long time amount. By carrying out like this, since the time amount concerning dark adaptation becomes long so that the illuminance ratio of tunnel inside and outside is large, predetermined time can be set up appropriately.

[0038] In invention of claim 22, a specific transit environment shall be a transit environment front scenery does not stop being able to be visible easily immediately after a car goes into a tunnel in invention of claim 2. That is, even if it goes into a tunnel like at nighttime, when front scenery does not stop being able to be visible easily, it is satisfactory even if it does not display an infrared image.

[0039] In invention of claim 22, when the illuminance ratio of tunnel inside and outside is smaller than the set point, the specific transit environmental judging means shall consist of invention of claim 23 so that it may judge with a car running in a specific transit environment. Since front scenery does not stop being able to be visible easily immediately after going into a

tunnel like [at the time of Nighttime] due to this when the illuminance ratio of tunnel inside and outside is small, an infrared image is not displayed.

[0040]

[Embodiment of the Invention] (Operation gestalt 1) Drawing 1 shows the important section of the instrument panel 1 of Car C (automobile: refer to drawing 3 and drawing 4) in which the display concerning the operation gestalt 1 of this invention was carried, and the entertainment display 2 and the infrared image display 3 as a display means by which the below-mentioned infrared image is displayed are formed in this instrument panel 1. The above-mentioned entertainment display 2 is the center of the vertical direction abbreviation of an instrument panel 1, and is arranged by the cross direction abbreviation mid gear. On the other hand, the above-mentioned infrared image display 3 is arranged in the drivers side edge in the meter unit 4 which is the upper part of an instrument panel 1 and was prepared in the cross direction abbreviation mid gear. By this, the infrared image display 3 will be arranged in the drivers side slanting upper part to the entertainment display 2.

[0041] Various warning lights, such as an AC-dynamo warning light and an oil pressure warning light, are prepared in a speedometer, a fuel gage, a water temperature gage, an odometer, a trip recorder, a selector indicator light and indicator lights, such as a turn signal indicator light, and a list at the above-mentioned meter unit 4.

[0042] As the above-mentioned meter unit 4 (infrared image display 3) is shown in drawing 2 , while being arranged in the before [a car] side edge section of an instrument panel 1, the above-mentioned entertainment display 2 is arranged in the backside [a car] rather than the infrared image display 3. By this, the perpendicular check-by-looking angle of the entertainment display 2, i.e., the vertical vectorial angle of the line which connects the entertainment display 2 and the eye point of the driver of Car C, is set as about 22 degrees, and the perpendicular check-by-looking angle of the infrared image display 3 is set as about 11 degrees, and the visibility of the infrared image display 3 is good rather than the entertainment display 2.

[0043] In addition, five are mounted electronic equipment (illustration is omitted in drawing 2), such as audio equipment, among drawing 1 , 6 is a steering wheel, and seven are front window glass among drawing 2 .

[0044] As shown in drawing 3 , the obstruction sensor 11 which detects the obstruction which exists ahead of this car C (the slanting front is also included), and measures the physical relationship and distance of Car C and its obstruction is formed in the front grille section of the cross direction abbreviation center section in the front end section of this car C. Specifically as this obstruction sensor 11, they are a laser radar, a millimeter wave radar, an ultrasonic radar, a CCD camera, etc.

[0045] Moreover, the infrared camera 12 as an image pick-up means to picturize the front of Car C with infrared radiation is formed in the side of the above-mentioned obstruction sensor 11 in a before [Car C] side bumper, and the infrared image picturized by this infrared camera 12 is displayed on the above-mentioned infrared image display 3. And a display on the infrared image display 3 of the above-mentioned infrared image is controlled by CPU20 as a display-control means like the after-mentioned, and an infrared image is displayed on the infrared image display 3, or it is not displayed.

[0046] Moreover, the rudder angle sensor 25 which detects the steering angle of the above-mentioned steering wheel 6 as shown in this car C at drawing 4 , The speed sensor 26 which detects the vehicle speed, and the GPS signal transmitted from a GPS satellite are received. The GPS sensor 27 as a current position detection means to detect the current position of Car C, CD-ROM28 (the road map information distributed through the Internet may be received) as a traffic information storage means which memorized road map information, The between highway and vehicle communication link unit 29 which receives the information (information,

such as existence of existence of a tunnel and a curve and delay and a road surface condition (a freezing way and bad road)) about the road situation ahead of [of Car C] a transit way etc. transmitted from the information offer equipment besides Car C (infrastructure) is formed.

[0047] Each signal (information) of the above-mentioned obstruction sensor 11, an infrared camera 12, the rudder angle sensor 25, a speed sensor 26, the GPS sensor 27, CD-ROM28, and the between highway and vehicle communication link unit 29 is inputted into the above CPU 20 as shown in drawing 5 . Moreover, the signal of the mode change-over switch 30 operational in a driver is inputted into CPU20. A driver can choose the one mode now with this mode change-over switch 30 among the automatic modes which perform automatically the on-mode in which the infrared image picturized by the above-mentioned infrared camera 12 is always displayed on the infrared image display 3, the off-mode which always is not displayed, a display, and un-displaying. And when on-mode is chosen from CPU20 to the infrared image display 3, ON signal is outputted, and an OFF signal is outputted when off-mode is chosen. On the other hand, when automatic mode is chosen, based on the input of each above-mentioned signal, CPU20 operates like the after-mentioned and outputs ON signal or an OFF signal to the infrared image display 3. In addition, when ON signal or an OFF signal is outputted from CPU20 based on the condition of a non-illustrated actuation switch and ON signal is outputted also to the entertainment display 2, a map, the current position of a car, etc. are displayed on the entertainment display 2.

[0048] Next, the flow chart of drawing 6 explains a display and the non-display control action of the infrared image in the above CPU 20.

[0049] First, it detects whether the mode change-over switch 30 is in which condition of on-mode, off-mode, and automatic mode at the first step SA 1, and judges whether the mode change-over switch 30 is in the condition in off-mode at the following step SA 2. When this judgment is YES and is in the condition in off-mode, it progresses to a step SA 9, and the return of the OFF signal is outputted and carried out to the infrared image display 3. On the other hand, the above-mentioned judgment is NO, and when it is not in the condition in off-mode, it progresses to a step SA 3 and judges whether the mode change-over switch 30 is in the condition in on-mode. When this judgment is YES and is in the condition in on-mode, it progresses to a step SA 8, and the return of the ON signal is outputted and carried out to the infrared image display 3. On the other hand, the judgment of a step SA 3 is NO, and when it is not in the condition in on-mode, it progresses to a step SA 4 (that is, when it is in the condition of automatic mode).

[0050] At the above-mentioned step SA 4, the GPS sensor 27 detects the current position of Car C, and Car C judges whether it is under [transit] ***** based on the current position and the road map information on CD-ROM28 by which detection was carried out [above-mentioned] at the following step SA 5 for the inside of a tunnel (the inside of the distance tunnel this side was beforehand decided to be is included): This distance decided beforehand is set up more greatly than the time of a non-operating state, when it is set up so greatly that the vehicle speed is large and a wiper is in an operating state. The judgment of this step SA 5 in addition, besides the approach of performing based on the current position and the road map information on CD-ROM28 which were detected by the GPS sensor 27 You may be the approach of inputting an origin, detecting the current position from transit locus information, such as the vehicle speed and a rudder angle, and performing based on this current position and road map information. Moreover, you may be the approach of performing based on the information which the between highway and vehicle communication link unit 29 received, and at least two of these three approaches may be further used together.

[0051] The judgment of the above-mentioned step SA 5 is NO, when it is not transit in a tunnel, it progresses to a step SA 9, and the return of the OFF signal is outputted and carried out to the infrared image display 3. On the other hand, when the judgment of a step SA 5 is YES and

is transit in a tunnel, it progresses to a step SA 6, the detection result of the obstruction sensor 11 is inputted, and it judges whether existence of an oncoming car was detected by the obstruction sensor 11 at the following step SA 7. It judges with existence of an oncoming car having been detected noting that the obstruction is an oncoming car when an obstruction is detected ahead [slanting] which specifically shifted from the transit way Car C is running to the side (Japan right-hand side) an oncoming car runs, and the approach relative velocity to the car of the detected obstruction is larger than a criteria rate.

[0052] When the judgment of the above-mentioned step SA 7 is YES and existence of an oncoming car is detected, while progressing to a step SA 8 and outputting and carrying out the return of the ON signal to the infrared image display 3, a judgment is NO, when existence of an oncoming car is not detected, it progresses to a step SA 9, and the return of the OFF signal is outputted and carried out to the infrared image display 3.

[0053] A transit detection means 41 in a tunnel by which the above-mentioned step SA 5 detects the transit in a tunnel of Car C consists of this operation gestalt 1. By the above-mentioned step SA 7 A specific transit environmental judging means 42 to judge whether Car C is running in the specific transit environment where it is not necessary to display an infrared image on the infrared image display 3 is constituted. When the transit in a tunnel of Car C is detected, although CPU20 displays an infrared image on the infrared image display 3, fundamentally When judged with Car C running in a specific transit environment, an infrared image is not displayed on the infrared image display 3 even if the transit in a tunnel of Car C is detected. The above-mentioned specific transit environment is a transit environment where the driver of a car does not produce dazzling in the light of an oncoming car. And specifically It is the transit environment where an oncoming car does not exist. The specific transit environmental judging means 42 When it has the obstruction sensor 11 as an oncoming car detection means to detect existence of an oncoming car and the oncoming car is not detected by this obstruction sensor 11, it is constituted so that it may judge with Car C running in a specific transit environment.

[0054] Therefore, when the transit in a tunnel of Car C is detected and existence of an oncoming car is detected, while an infrared image is displayed on the infrared image display 3, when existence of an oncoming car is not detected, an infrared image is not expressed on the infrared image display 3 as the above-mentioned operation gestalt 1. Moreover, when the transit in a tunnel of Car C is not detected, an infrared image is not displayed on the infrared image display 3. Since visibility gets worse suddenly and an infrared image is displayed especially for a driver in risk by this at the time of the sensitive transit in a tunnel, the visibility in a tunnel can improve and the safety at the time of the transit in a tunnel can be raised. On the other hand, at the time except the transit in a tunnel, an infrared image is not displayed, and moreover, even if it is transit in a tunnel, if the inside of the specific transit environment where the light of an oncoming car does not go into the eye of a driver is under transit, an infrared image will not be displayed. Therefore, safety can be raised, making it the display of an infrared image not become offensive to the eye [a driver] as much as possible.

[0055] (Operation gestalt 2) Drawing 7 shows the operation gestalt 2 of this invention (with each operation gestalt of still the following, in the hard configuration of a display being the same as that of the above-mentioned operation gestalt 1 fundamentally and differing, it explains the different point), and does not detect existence of an oncoming car, but detects existence of the opposite lane.

[0056] Namely, with this operation gestalt 2, it sets to steps SB1-SB5. Perform the respectively same processing as steps SA1-SA5 in the above-mentioned operation gestalt 1, and when the judgment of a step SB 5 is NO and is not transit in a tunnel It progresses to a step SB 8, and while outputting and carrying out the return of the OFF signal to the infrared image display 3, when the judgment of a step SB 5 is YES and is transit in a tunnel, it progresses to a step SB

6.

[0057] At the above-mentioned step SB 6, it judges whether the opposite lane exists based on the road map information memorized by the current position and CD-ROM28 of the car C detected by the GPS sensor 27. This judgment is YES, when the opposite lane exists, while outputting and carrying out the return of the ON signal to the infrared image display 3, a judgment is NO, when the opposite lane does not exist, it progresses to a step SB 8, and the return of the OFF signal is outputted and carried out to the infrared image display 3.

[0058] The same transit detection means 41 in a tunnel as the above-mentioned operation gestalt 1 is constituted by the above-mentioned step SB 5, and a specific transit environmental judging means 43 to judge whether Car C is running in a specific transit environment by the existence of the opposite lane with the above-mentioned step SB 6 consists of this operation gestalt 2. And the GPS sensor 27 and CD-ROM28 While being a part of transit detection means 41 in a tunnel, it is also a part of specific transit environmental judging means 43. This specific transit environmental judging means 43 When it is detected that Car C is running the road where the opposite lane does not exist based on the road map information memorized by the current position and CD-ROM28 of the car C detected by the GPS sensor 27 It is constituted so that it may judge with Car C running in a specific transit environment (the transit environment where the driver of a car does not produce dazzling in the light of an oncoming car, transit environment where an oncoming car does not specifically exist).

[0059] Therefore, when the transit in a tunnel of Car C is detected and the opposite lane exists, while an infrared image is displayed on the infrared image display 3, when the inside of the transit environment (transit environment where an oncoming car does not exist) where the opposite lane does not exist is under transit, an infrared image is not expressed on the infrared image display 3 as the above-mentioned operation gestalt 2. Consequently, the visibility in a tunnel can be raised like the above-mentioned operation gestalt 1, making it the display of an infrared image not become offensive to the eye [a driver] as much as possible.

[0060] In addition, although he is trying to display an infrared image on the infrared image display 3 unconditionally in automatic mode with the above-mentioned operation gestalt 2 when the opposite lane exists The opposite lane may exist, or when the distance from Car C to the opposite lane is larger than setting distance, you may make it not make it display like the below-mentioned operation gestalt 5 (while running the foot-walk side among the time of there being a median strip, or two or more lanes).

[0061] (Operation gestalt 3) Even if the operation gestalt 3 of this invention is shown and the opposite lane exists, when the distance between two cars of Car C and a forward vehicle (precedence vehicle) is below predetermined distance, it is made for drawing 8 not to display an infrared image on the infrared image display 3.

[0062] Namely, with this operation gestalt 3, it sets to steps SC1-SC6. When the respectively same processing as steps SB1-SB6 in the above-mentioned operation gestalt 2 is performed, the judgment of a step SC 6 is NO and the opposite lane does not exist It progresses to a step SC 10, and while outputting and carrying out the return of the OFF signal to the infrared image display 3, the judgment of a step SC 6 is YES, and when the opposite lane exists, it progresses to a step SC 7.

[0063] At the above-mentioned step SC 7, the detection result (distance between two cars of Car C and a forward vehicle) of the obstruction sensor 11 is inputted, and it judges whether the distance between two cars of Car C and a forward vehicle is below predetermined distance at the following step SC 8. Or the light of an oncoming car does not worry this predetermined distance for a driver like [at the time of delay transit], it is set as the distance (for example, about 10m) which becomes the shadow of a forward vehicle and cannot go into the eye of a driver easily. The judgment of the above-mentioned step SC 8 is NO, when the distance between two cars is larger than predetermined distance, while progressing to a step SC 9 and

outputting and carrying out the return of the ON signal to the infrared image display 3, a judgment is YES, when the distance between two cars is below predetermined distance, it progresses to a step SC 10, and the return of the OFF signal is outputted and carried out to the infrared image display 3.

[0064] The transit detection means 41 in a tunnel is constituted from this operation gestalt 3 by the above-mentioned step SC 5. By the above-mentioned step SC 6 The specific transit environmental judging means 43 in the above-mentioned operation gestalt 2 and the 1st same specific transit environmental judging means 44 are constituted. By the above-mentioned step SC 8 When the distance between two cars of the Car C and the forward vehicle which have the obstruction sensor 11 as a distance-between-two-cars detection means to detect the distance between two cars of Car C and a forward vehicle, and were detected by this obstruction sensor 11 is below predetermined distance The 2nd specific transit environmental judging means 45 judged as Car C running in a specific transit environment is constituted. In the light of an oncoming car, when judged with the driver of Car C judging whether the specific transit environment which does not produce dazzling is under transit, and running in this specific transit environment, even if Car C is transit in a tunnel, as for both these [1st] and the 2nd specific transit environmental judging means 44 and 45, it is not displayed, as for an infrared image.

[0065] Therefore, with the above-mentioned operation gestalt 3, when the transit in a tunnel of Car C is detected, it sets. By detecting existence of the opposite lane, when the distance between two cars of Car C and a forward vehicle is larger than predetermined distance While an infrared image is displayed on the infrared image display 3, when existence of the opposite lane is not detected, Or even if existence of the opposite lane is detected, when the distance between two cars is below predetermined distance, it is supposed that Car C is running in a specific transit environment, and an infrared image is not displayed on the infrared image display 3. While the same operation effectiveness as the above-mentioned operation gestalten 1 and 2 is acquired by this, the display of an infrared image stops it to be able to become easily more offensive to the eye [a driver] than the above-mentioned operation gestalten 1 and 2 due to the 1st and 2nd specific transit environmental judging means 44 and 45.

[0066] In addition, with the above-mentioned operation gestalt 3, although the 1st and 2nd specific transit environmental judging means 44 and 45 were established, only the 2nd specific transit environmental judging means 45 may be established. That is, when the distance between two cars is larger than predetermined distance, while losing the judgment of whether the opposite lane exists, and displaying an infrared image on the infrared image display 3 regardless of the existence of the opposite lane, when the distance between two cars is below predetermined distance, you may make it not display an infrared image on the infrared image display 3.

[0067] (Operation gestalt 4) Even if the operation gestalt 4 of this invention is shown and the opposite lane exists, when the vehicle speed of Car C is below the predetermined vehicle speed, it is made for drawing 9 not to display an infrared image on the infrared image display 3.

[0068] Namely, with this operation gestalt 4, it sets to steps SD1-SD6. When the respectively same processing as steps SB1-SB6 in the above-mentioned operation gestalt 2 is performed, the judgment of a step SD 6 is NO and the opposite lane does not exist It progresses to a step SD 10, and while outputting and carrying out the return of the OFF signal to the infrared image display 3, the judgment of a step SD 6 is YES, and when the opposite lane exists, it progresses to a step SD 7.

[0069] At the above-mentioned step SD 7, the detection result of a speed sensor 26 is inputted and it judges whether the vehicle speed of Car C is below the predetermined vehicle speed at the following step SD 8. This predetermined vehicle speed is set as the late remarkable rate

(for example, 20 km/h) which the light of an oncoming car does not worry for a driver like [at the time of delay transit]. The judgment of the above-mentioned step SD 8 is NO, when the vehicle speed is larger than the predetermined vehicle speed, while progressing to a step SD 9 and outputting and carrying out the return of the ON signal to the infrared image display 3, a judgment is YES, when the vehicle speed is below the predetermined vehicle speed, it progresses to a step SD 10, and the return of the OFF signal is outputted and carried out to the infrared image display 3.

[0070] The transit detection means 41 in a tunnel is constituted from this operation gestalt 4 by the above-mentioned step SD 5. By the step SD 6 The specific transit environmental judging means 43 in the above-mentioned operation gestalt 2 and the 1st same specific transit environmental judging means 46 are constituted. By the above-mentioned step SD 8 It has the speed sensor 26 as a vehicle speed detection means to detect the vehicle speed of Car C, and when the vehicle speed of the car C detected by this speed sensor 26 is below the predetermined vehicle speed, the 2nd specific transit environmental judging means 47 judged as Car C running in a specific transit environment is constituted. It judges whether the specific transit environment where, as for these [1st] and the 2nd specific transit environmental judging means 46 and 47, the driver of Car C does not produce [Car C] dazzling in the light of an oncoming car like [both] the above-mentioned operation gestalt 3 is under transit, and when judged with the inside of this specific transit environment being under transit, an infrared image is not displayed even if it is transit in a tunnel.

[0071] [when the transit in a tunnel of Car C is detected with the above-mentioned operation gestalt 4] therefore, by detecting existence of the opposite lane, when the vehicle speed of Car C is larger than the predetermined vehicle speed While an infrared image is displayed on the infrared image display 3, even if it is transit in a tunnel, when existence of the opposite lane is not detected, Or when the vehicle speed is below the predetermined vehicle speed, it is supposed that Car C is running in a specific transit environment, and an infrared image is not displayed on the infrared image display 3. Consequently, the same operation effectiveness as the above-mentioned operation gestalt 3 is acquired.

[0072] In addition, with the above-mentioned operation gestalt 4, although the 1st and 2nd specific transit environmental judging means 46 and 47 were established, only the 2nd specific transit environmental judging means 47 may be established. That is, when the vehicle speed of Car C is larger than the predetermined vehicle speed, while displaying an infrared image on the infrared image display 3 regardless of the existence of the opposite lane, when the vehicle speed is below the predetermined vehicle speed, you may make it not display an infrared image on the infrared image display 3.

[0073] Moreover, with the above-mentioned operation gestalten 3 and 4, when the distance between two cars of Car C and a forward vehicle is below predetermined distance or the vehicle speed of Car C is below the predetermined vehicle speed Although judged with Car C running in a specific transit environment (transit environment where the driver of a car does not produce dazzling in the light of an oncoming car like [at the time of delay]) When the between highway and vehicle communication link unit 29 receives the information that it is running in the section when Car C is congested, it judges to instead of [these] with Car C running in a specific transit environment, and you may make it not make the infrared image display 3 display an infrared image on them. In this case, when it has the between highway and vehicle communication link unit 29 as a delay transit detection means and delay transit of Car C is detected by this between highway and vehicle communication link unit 29, the 2nd specific transit environmental judging means 45 and 47 is constituted so that it may judge with Car C running in a specific transit environment.

[0074] Even if the operation gestalt 5 of this invention is shown and an oncoming car exists, drawing 10 (Operation gestalt 5) When the distance from Car C to the opposite lane is larger

than setting distance While making it not display an infrared image on the infrared image display 3 The distance from Car C to the opposite lane is below the above-mentioned setting distance, and when it is detected that the car is circling toward an opposite lane side, it is made to display an infrared image on the infrared image display 3.

[0075] Namely, with this operation gestalt 5, it sets to steps SE1-SE7. When the respectively same processing as steps SA1-SA7 in the above-mentioned operation gestalt 1 is performed, the judgment of a step SA 7 is NO and an oncoming car does not exist It progresses to a step SE 13, and while outputting and carrying out the return of the OFF signal to the infrared image display 3, the judgment of a step SE 7 is YES, and when an oncoming car exists, it progresses to a step SE 8.

[0076] At the above-mentioned step SE 8, it judges whether the distance from Car C to the opposite lane is larger than setting distance based on the current position and the road map information on CD-ROM28 which were detected by the GPS sensor 27 in a step SE 4. This judgment is the existence (when a median strip exists) of a median strip. the distance to the opposite lane is larger than setting distance -- judging -- when two or more lanes exist, or it is running [whether Car C is running the foot-walk side or] the central site (while running the foot-walk side) It carries out according to judging with the distance to the opposite lane being larger than setting distance etc. (in addition). You may judge based on the information which the between highway and vehicle communication link unit 29 received, and may make it distinguish the lane where the magnetometric sensor formed in Car C detects the magnetic signal outputted from the magnet embedded on the road surface, and Car C is running the signal.

[0077] The judgment of the above-mentioned step SE 8 is YES, and when the distance from Car C to the opposite lane is larger than setting distance, while progressing to a step SE 13 and outputting and carrying out the return of the OFF signal to the infrared image display 3, the above-mentioned judgment is NO, and when the above-mentioned distance is below setting distance, it progresses to a step SE 9.

[0078] In the above-mentioned step SE 9, the detection result of the rudder angle sensor 25 is inputted, and a steering angle judges whether it is more than a predetermined rudder angle at the following step SE 10. This judgment is NO, and when a steering angle is smaller than a predetermined rudder angle, while progressing to a step SE 13 and outputting and carrying out the return of the OFF signal to the infrared image display 3, the above-mentioned judgment is YES, and when a steering angle is more than a predetermined rudder angle, it progresses to a step SE 11.

[0079] At the above-mentioned step SE 11, it judges whether Car C is circling toward the opposite lane side (not only curve transit but lane modification actuation is included). While this judgment is YES and Car C is circling toward an opposite lane side, and progressing to a step SE 12 and outputting and carrying out the return of the ON signal to the infrared image display 3, a judgment is NO, while Car C is not circling toward an opposite lane side, it progresses to a step SE 13, and the return of the OFF signal is outputted and carried out to the infrared image display 3.

[0080] The transit detection means 41 in a tunnel is constituted by the above-mentioned step SE 5, and the specific transit environmental judging means 42 in the above-mentioned operation gestalt 1 and the 1st same specific transit environmental judging means 48 are constituted from this operation gestalt 5 by the above-mentioned step SE 7. Moreover, it has the GPS sensor 27 and CD-ROM28 as a car and a distance detection means between the opposite lane which detect the distance from Car C to the opposite lane by the above-mentioned step SE 8. When the distance from the car C detected by this GPS sensor 27 and CD-ROM28 to the opposite lane is larger than setting distance The 2nd specific transit environmental judging means 49 judged as Car C running in a specific transit environment is

constituted, and the 3rd specific transit environmental judging means 50 is constituted by the above-mentioned step SE 11. This 3rd specific transit environmental judging means 50 has the rudder angle sensor 25 as a revolution detection means. When it is detected that Car C is circling toward an opposite lane side by this rudder angle sensor 25 It is constituted so that it may judge with Car C not running [be / it] in a specific transit environment, and when the steering angle by the side of the opposite lane is more than a predetermined rudder angle, the rudder angle sensor 25 is constituted so that it may detect that the car is circling toward an opposite lane side.

[0081] Therefore, when the transit in a tunnel of Car C is detected, while existence of an oncoming car is detected with the above-mentioned operation gestalt 5 While the distance from Car C to the opposite lane is below setting distance and Car C is circling toward an opposite lane side While an infrared image is displayed on the infrared image display 3, even if it is transit in a tunnel When existence of the opposite lane is not detected, when the distance from Car C to the opposite lane is larger than setting distance, Or while Car C is not circling toward an opposite lane side, it is supposed that Car C is running in a specific transit environment, and an infrared image is not displayed on the infrared image display 3. Therefore, the display can be performed, only when the specific transit environment where the driver of Car C does not produce dazzling in the light of an oncoming car is detected certainly and a driver needs the display of an infrared image.

[0082] in addition -- the above-mentioned operation gestalt 5 -- the 1- although the 3rd specific transit environmental judging means 48-50 was established, you may make it prepare only at least one of the 2nd and 3rd specific transit environmental judging means 49 and 50

[0083] (Operation gestalt 6) Even if the operation gestalt 6 of this invention is shown and an oncoming car does not exist, when it is detected that the curve which goes to an opposite lane side ahead of Car C exists, drawing 11 judges with Car C not running [be / it] in a specific transit environment, and it is made to display an infrared image on the infrared image display 3.

[0084] Namely, with this operation gestalt 6, it sets to steps SF1-SF7. When the respectively same processing as steps SA1-SA7 in the above-mentioned operation gestalt 1 is performed, the judgment of a step SF 7 is YES and an oncoming car exists It progresses to a step SF 9, and while outputting and carrying out the return of the ON signal to the infrared image display 3, the judgment of a step SF 7 is NO, and when an oncoming car does not exist, it progresses to a step SF 8.

[0085] At the above-mentioned step SF 8, it judges whether the curve which goes to an opposite lane side ahead of Car C (transit way front) exists. That is, the between highway and vehicle communication link unit 29 judges whether the information in which a curve exists ahead of Car C was received. In addition, this judgment may be the approach of inputting an origin, detecting the current position from transit locus information, such as the vehicle speed and a rudder angle, and performing based on this current position and road map information.

[0086] The judgment of the above-mentioned step SF 8 is YES, when a curve exists, while outputting and carrying out the return of the ON signal to the infrared image display 3, a judgment is NO, and when a curve does not exist, the return of the OFF signal is outputted and carried out to the infrared image display 3.

[0087] The transit detection means 41 in a tunnel is constituted by the above-mentioned step SF 5, the specific transit environmental judging means 42 in the above-mentioned operation gestalt 1 and the 1st same specific transit environmental judging means 51 are constituted by the above-mentioned step SF 7, and the 2nd specific transit environmental judging means 52 is constituted from this operation gestalt 6 by the above-mentioned step SF 8. This 2nd specific transit environmental judging means 52 has the between highway and vehicle communication link unit 29 as a curve detection means which detects that the curve which

goes to an opposite-lane side ahead of Car C exists, and when it is detected that the curve which goes to an opposite-lane side ahead of Car C by this between highway and vehicle communication link unit 29 exists, it is constituted so that it may judge [that a car C is not / be / it / under transit about the inside of a specific transit environment, and].

[0088] Therefore, when the transit in a tunnel of Car C is detected and existence of an oncoming car is detected with the above-mentioned operation gestalt 6, or even if existence of an oncoming car is not detected, when it is detected that a curve exists ahead of Car C While an infrared image is displayed on the infrared image display 3, when neither existence of an oncoming car nor existence of a curve is detected, it is supposed that Car C is running in a specific transit environment, and an infrared image is not displayed on the infrared image display 3. Therefore, since it is expected that a driver produces dazzling in the light of an oncoming car when it is detected that the curve which goes to an opposite lane side exists, an infrared image is displayed on the infrared image display 3, and can raise safety.

[0089] In addition, although the 1st and 2nd specific transit environmental judging means 51 and 52 were established, you may make it establish only the 2nd specific transit environmental judging means 52 with the above-mentioned operation gestalt 6.

[0090] (Operation gestalt 7) Drawing 12 and drawing 13 show the operation gestalt 7 of this invention, and even if the driver of a car receives the light of an oncoming car for a specific transit environment, they are taken as the transit environment where it is hard to sense risk.

[0091] That is, with this operation gestalt 7, as shown in drawing 12, each signal (information) of the obstruction sensor 11, an infrared camera 12, the GPS sensor 27, CD-ROM28, the mode change-over switch 30, and the individual humanity news storage 31 is inputted into CPU20. The above-mentioned individual humanity news storage 31 inputs and memorizes the individual humanity news (an identifier, house address, etc.) by inserting the smart card on which individual humanity news was recorded, and also has the role which identifies the owner of Car C and prevents a theft.

[0092] And CPU20 operates like drawing 13. That is, in steps SG1-SG7, the respectively same processing as steps SA1-SA7 in the above-mentioned operation gestalt 1 is performed, the judgment of step SG7 is NO, and the judgment of step SG7 is YES, and when an oncoming car does not exist, while progressing to step SG14 and outputting and carrying out the return of the OFF signal to the infrared image display 3, when an oncoming car exists, it progresses to step SG8.

[0093] At the above-mentioned step SG8, an obstruction (for example, on the street a falling object and a halt car) the front of Car C -- and the criteria distance (the distance in which a driver can fully avoid contact with an obstruction by braking or steering --) from this car C or when it judges, and this judgment is YES and an obstruction exists, whether the obstruction sensor 11 exists an obstruction within a detectable distance with a sufficient precision It progresses to step SG13, and while outputting and carrying out the return of the ON signal to the infrared image display 3, a judgment is NO, and when an obstruction does not exist, it progresses to step SG9.

[0094] At the above-mentioned step SG9, the high use frequency roads (for example, the road used for the road in area with a radius of 20km, commutation, attending school, shopping, etc. from a house, the road along which it passed more than the count of predetermined) where the operating frequency of the driver which is performing current operation is high are extracted from the road map information memorized by CD-ROM28 according to the individual humanity news memorized by the individual humanity news storage 31. Then, it judges whether current position empty vehicle both C detected by the GPS sensor 27 is running the above-mentioned quantity use frequency road at step SG11.

* NOTICES *

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the front view showing the important section of the instrument panel of a car in which the display concerning the operation gestalt 1 of this invention was carried.

[Drawing 2] It is the II-II line sectional view of drawing 1 .

[Drawing 3] It is the perspective view showing the location in the car of each component part of a display.

[Drawing 4] It is the top view showing the location in the car of each component part of a display.

[Drawing 5] It is the block diagram showing the configuration of an indicating equipment.

[Drawing 6] It is the flow chart which shows display-control actuation of CPU.

[Drawing 7] It is a flow chart of drawing 6 which shows the operation gestalt 2.

[Drawing 8] It is a flow chart of drawing 6 which shows the operation gestalt 3.

[Drawing 9] It is a flow chart of drawing 6 which shows the operation gestalt 4.

[Drawing 10] It is a flow chart of drawing 6 which shows the operation gestalt 5.

[Drawing 11] It is a flow chart of drawing 6 which shows the operation gestalt 6.

[Drawing 12] It is the drawing 5 equivalent Fig. showing the operation gestalt 7.

[Drawing 13] It is a flow chart of drawing 6 which shows the operation gestalt 7.

[Drawing 14] It is the drawing 5 equivalent Fig. showing the operation gestalt 8.

[Drawing 15] It is a flow chart of drawing 6 which shows the operation gestalt 8.

[Drawing 16] It is the graph which shows the relation between the illuminance ratio of tunnel inside and outside, and predetermined time.

[Description of Notations]

C Car

3 Infrared Image Display (Display Means)

11 Obstruction Detection Sensor (Distance-between-Two-Cars Detection Means) (Oncoming Car Detection Means) (Obstruction Detection Means)

12 Infrared Camera (Image Pick-up Means)

20 CPU (Display-Control Means)

25 Rudder Angle Sensor (Revolution Detection Means)

26 Speed Sensor (Vehicle Speed Detection Means)

27 GPS Sensor (Width-of-Road Detection Means) (Current Position Detection Means) (Car and Distance Detection Means between Opposite Lane)

28 CD-ROM (Width-of-Road Detection Means) (Traffic Information Storage Means) (Car and Distance Detection Means between Opposite Lane)

29 Between Highway and Vehicle Communication Link Unit (Delay Transit Detection Means) (Curve Detection Means)

31 Individual Humanity News Storage (Individual Humanity News Storage Means)

35 High Use Frequency Road Extract Means

41 Transit Detection Means in Tunnel
42-56 Specific transit environmental judging means

[Translation done.]